ISO/IEC 15693 Protocol HF Tag Reader RR9036 User's Manual V3.80

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1. COMMUNICATION INTERFACE SPECIFICATION

RR9036* communicates with host (MCU，MPU，Controller) using serial communication interface RS232 or RS485 and complete corresponding operation according to the host command. The communication parameter is 19200bps 1 start bit, 8 data bits, 1 stop bit without parity check bit. In the process of serial communication, the least significant bit of one byte is transmitted first and the least significant byte of command data sequence is transmitted first.

**The RR9036 in this manual refers to RR9036SR, RR9036USB and RR9036CF except specially noted.*

2. PROTOCOL DESCRIPTION

A communication procedure is sponsored by the host sending commands and data to RR9036 and RR9036 returns the result status and data to host after command execution.

The RR9036 will send 4 bytes data once to check whether the RXD and TXD (pin2&3 in DB9 of RS232 connector) are connected when powered on. If RXD and TXD are connected, RR9036 will turn into "demo mode".

The following table shows the process of the host computer command:

HOST	DIRECTION	RR9036	COMMENT
Command Data Block	→		The interval between two consecutive bytes in the command data block should be less than 15ms. During command data block sending, synchronization will lost if the host receives any data from RR9036 and the host should stop command sending and restart the communication after 15ms.

The command data block the post sending to RR9036 should conform to the format of the protocol. The block includes address、operation command symbol、operation control symbol、command operand and CRC-16 checksum.

RR9036 completes command execution in 1s (not including host sending data time) except inventory command after receiving host command and returns the results. During the period, RR9036 doesn't process any host data. The feedback of command execution results is as follows:

READER	DIRECTION	HOST	COMMENT
Response data block	→		The interval between two consecutive bytes in the response data block should be less than 15ms.

The response data block includes address、command execution result status and response data. After the feedback, a whole communication process finishes.

3. DATA BLOCK FORMAT

A. COMMAND DATA BLOCK

Len	Com_adr	Cmd	State	Data[]	LSB-CRC16	MSB-CRC16

Len: Command data block length 1 byte (not including itself). Value range is 5~25. The number of Len equals the length of Data[] plus 5.

Com_adr: Reader address, 1 byte. Value range is 0~254. Only will the reader conforming to the address response the command data block.. Value 255 is broadcasting address. All the readers will response to the command data block with a broadcasting address.

Cmd: Operation command symbol, 1 byte. It defines 21 commands.

State: Operation control symbol, 1 byte. Low 4-bytes control operation mode (refer to each command description for details); High 4-bytes control operation style, value "0" means ISO/IEC 15693 protocol command while value "F" means reader-defined command and other values are invalid.

Data[]: Operation command parameters. There is no parameters if the LEN item equals 5.

CRC16: CRC-16 checksum, 2 bytes with least significant byte first.

B. RESPONSE DATA BLOCK

Len	Com_adr	Status	Data[]	LSB-CRC16	MSB-CRC16

Len: Response data block, 1 byte. Value range is 4~28. The number of Len equals the length of Data[] plus 4.

Com_adr: Reader address, 1 byte. Value rang is 0~254.

Status: Result status value, 1byte. Refer to following table for details.

Data[]: Response data. There is no this item if Len equals 4.

CRC16: CRC-16 checksum, 2 bytes with least significant byte first.

Note: RR9036 won't response if any error found in command data block.

The default value of RR9036 address Com_adr is 0x00. Users may change it by RR9036 reader-defined command "Write Com_adr".

Cyclic Redundancy Check (CRC) computation includes all data from Len. The CRC generation polynomial is the same as that defined in ISO/IEC 15693 protocol without reversing the computation result. For example, a data block is presented as follows: 0x05, 0xFF, 0x01, 0x00, LSB-CRC, MSB-CRC. CRC checksum is LSB-CRC＝0x5D，MSB-CRC＝0xB2. A reference CRC computation program is presented as follow:

Polynomial: POLYNOMIAL=0x8408;
Start Value: PRESET_VALUE=0xffff;

C-Example:

```
int i,j;
unsigned int current_crc_value=PRESET_VALUE;
```

```
for(i=0;i<len;i++)    /*len=number of protocol bytes without CRC*/
{
    current_crc_value=current_crc_value^((unsigned    int)pData[i]);
    for(j=0;j<8;j++)
    {
    if(current_crc_value&0x0001)
    {
        current_crc_value=(current_crc_value>>1)^POLYNOMIAL;
    }
    else
    {
        current_crc_value=(current_crc_value>>1);
    }
    }
}
    pData[i++]=(unsigned char)(current_crc_value&0x00ff);
    pData[i]=(unsigned char)((current_crc_value>>8)&0x00ff);
```

4. OPERATION COMMAND (CMD) SUMMARY

RR9036 supports 18 commands. Multi-mode operation could be realized by defining operation control symbol (state) when host transmits a command data block. The detailed description of every command can be found in the latter chapters.

13 out of 18 commands are ISO/IEC 15693 protocol command (shown in the following table). The high 4-bits of the operation control symbol (State) should be set to "0" when host transmits the commands.

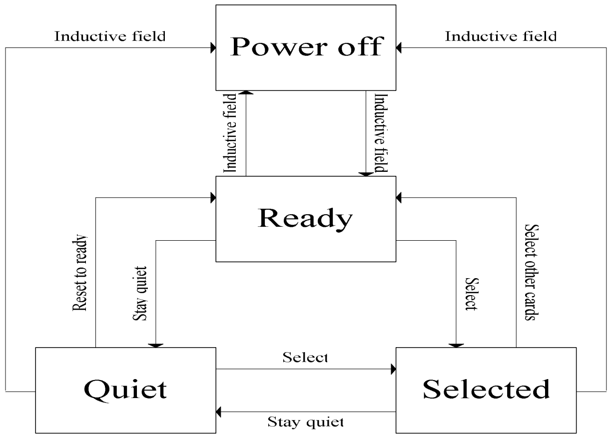
COMMAND		PARAMETER			COMMENT
NAME	VALUE	Send		Receive (if operation successes)	
		Addressed mode	Selected mode		
Inventory	0x01	—		_DSFID, _UID	Check if any tag exist in the effective field
Stay Quiet	0x02	_UID	—	—	Turn appointed tag into Quiet state and no response to further inventory command.
Read Single Block	0x20	_UID, _block number	_block number	_block security status, _data	Read out data in appointed block which is 4 or 8 bytes and its security state.
Write Single Block	0x21	_UID, _block number, _data	_block number, _data	—	Write data of 4 or 8 bytes into appointed block.

Lock Block	0x22	_UID，_block number	_block number	—	Lock appointed block to turn it into a "read-only" one.
Read Multiple Block	0x23	_UID, _first block number, _number of block	_first block number, _number of block	_block security status，_data (repeating _number of block times)	Read out data of appointed multiple blocks synchronously and their security state.
Select	0x25	_UID	—	—	Turn appointed tag into "selected state".
Reset to Ready	0x26	_UID	—	—	Turn appointed tag into "Ready state".
Write AFI	0x27	_UID ，_AFI	_AFI	—	Write the Application Family Identifier of appointed tag.
Lock AFI	0x28	_UID	—	—	Lock the Application Family Identifier of appointed tag.
Write DSFID	0x29	_UID，_DSFID	_DSFID	—	Write the Data Storage Format IDentifier of appointed tag.
Lock DSFID	0x2A	_UID	—	—	Lock the Data Storage Format IDentifier of appointed tag.
Get System Information	0x2B	_UID	—	_Information Flag，_UID，_DSFID，_AFI，_Memory，_IC reference	Get detailed information of appointed tag.

- **Note：AFI, the Application Family Identifier.**
- **Note：DSFID, the Data Storage Format IDentifier.**
- **Note：UID, Unique IDentifier，every tag holds an unique UID(8 bytes) as follows:**

Bit64～bit57	Bit56～bit49	Bit48～bit1
0xE0	Manufacturer code	Unique serial number

- **Note：The tags which conforms to ISO/IEC protocol stores data in block with 4 or 8 bytes unit.**
- **Note：Access mode which contains tags' UID is "addressed operation mode".**
- **Note：Access mode which doesn't contain tags' UID is "selected operation mode". To access tag in this operation mode, "Select" command should be executed first on a tag to make it in "Selected stated". Then all command operation in "selected operation mode" will be aimed at this tag.**
- **Note：The following figure shows the state transfer of a tag.**



5 out of the 18 commands are reader-defined commands (shown in the following table). When host send them, the high 4-bits of operation control symbol (State) should be "F".

COMMAND		**PARAMETER**		**COMMENT**
NAME	**VALUE**	**SEND**	**RECEIVE**	
Get Reader Information	0x00	—	_Version, _Reader_type, _Tr_type, _Inventory Scan Time	Gain reader address 、 reader software version、reader type、reader protocol information and Inventory Scan Time.
Close RF	0x01	—	—	Close inductive field. When the field closed, the reader will not execute any ISO/IEC 15693 protocol command the host sends and return corresponding error code.
Open RF	0x02	—	—	Open inductive field.
Write Com_adr	0x03	_Com_adr	—	Set reader address of the reader.
Write InventoryScanTime	0x04	_Inventory ScanTime	—	Set InventoryScanTime value.

5. LIST OF COMMAND EXECUTION RESULT STATUS

The high 4-bits and low 4-bits of command execution result status byte have different meaning. Low 4-bits indicates command execution result and high 4-bits indicates protocol style. High 4-bits are all zero for ISO/IEC 15693 protocol. The following table show the details:

RESPONSE DATA BLOCK					STATUS	COMMENT
Len	Com_adr	**Status**	Data[]	CRC-16		
Legnth of Data[] +4	0xXX	**0x00**	…	LSM+ MSB	Success	Return status 0 to host after command is executed successfully. Data block contains result data.
4	0xXX	**0x01**	—	LSM+ MSB	Command operand length error	Return status 1 to host when the number of command operands doesn't conform to the command request.
4	0xXX	**0x02**	—	LSM+ MSB	Command not supported	Return status 2 to host when the reader does not support the command the host sends.
4	0xXX	**0x03**	—	LSM+ MSB	Operand out of range	Return status 3 to host when one or more operand of command data block sent by host are out of range.
4	0xXX	**0x05**	—	LSM+ MSB	Inductive field closed	Return status 5 to host when the inductive field is closed and the host sends a ISO/IEC 15693 command.
4	0xXX	**0x06**	—	LSM+ MSB	EEPROM operation error	Return status 6 to host when the reader encounters error in EEPROM access.
4	0xXX	**0x0A**	—	LSM+ MSB	Inventory-Scan-Time overflow	Return status 0x0A when the reader execute an Inventory command and does not get one complete tag's UID before user-defined Inventory-ScanTime overflows.
4	0xXX	**0x0B**	—	LSM+ MSB	Inventory not finished before Inventory-Scan-Time overflows	Return status 0x0B when the reader execute an Inventory command and does not get all tag's UIDs before user-defined Inventory-ScanTime overflows.
4	0xXX	**0x0C**	—	LSM+ MSB	ISO error	Return status 0x0C when the reader finds one or more tag response in a way that is not compatible with ISO/IEC 15693 protocol definition.
4	0xXX	**0x0E**	—	LSM+ MSB	No tags	Return ox0E when the reader finds no active tag in the inductive field.

5	0xXX	**0x0F**	Error_ code	LSM+ MSB	Operation error	Return status 0x0F when an error occurred in command execution and the further information of the error is defined by the Error_code in response data block.

- **Note: The length (Len) of response data block when a command finished successfully will vary from command to command. Further information could be found in following detailed description of individual command.**
- **Note: When the reader return status 0x0F, the Error_code in response data block indicate further explanation to the error occurred in command execution. The definition of Error_code is available in following chapter.**

6. ERROR_CODE DEFINITION

When the reader return status 0x0F, the Error_code in response data block indicate further explanation to the error occurred in command execution. The value of Erro_code is predefined by the ISO/IEC 15693 protocol as follows:

CODE	COMMENT
0x01	Commands not support. For example: invalid command code
0x02	Commands can not be identified. For example: invalid command format
0x03	Operation not supported
0x0f	Unknown error
0x10	Appointed block is not available or don't exist.
0x11	Appointed block has been locked and can't be locked again.
0x12	Appointed block is locked and can't change its content.
0x13	Appointed block does not operate normally.
0x14	Appointed block can't be locked normally.
0xA0~0xDF	User-defined error code.

7. DETAILED DESCRIPTION OF OPERATION COMMAND

RR9036 supports 18 commands. Every command may run in multiple modes. Detailed description of RR9036 supported commands is presented as follow:

7.1 ISO/IEC 15693 PROTOCOL COMMAND

RR9036 supports 13 ISO/IEC 15693 protocol commands. When host sends these commands, high 4-bits of operation control style (State) should be set to all 0s.

ISO/IEC 15693 protocol commands could only be available when the inductive field is on. The inductive field could be turned on by reader-defined command "Open RF". The default state of inductive field is on when RR9036 is powered on.

7.1.1 INVENTORY

The function of inventory command is to check the existence of any ISO/IEC 15693 compatible tags in inductive field and get the UIDs of the tags.

Before running the inventory command, users can set InventoryScanTime according to their requirement. The default value of InventoryScanTime is 3s. Its value can be changed by reader-defined command "Write InventoryScanTime". The range of InventoryScanTime is 3*100ms~255*100ms. In most cases, Value 3s is a good choice in most circumstances. User can appropriately set the time to meet their specific requirements. Two points should be taken into consideration. One is the value could be set a smaller value to speed up the response of inventory command, the other one is the value should not be set too small to process all the tags in inductive field efficiently especially when there are a lot of tags at the same time.

If the InventoryScanTime value is set a too small value to get one tag's UID in the set time limit, the reader will return a response data block as follow:

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x0A	—	LSB	MSB

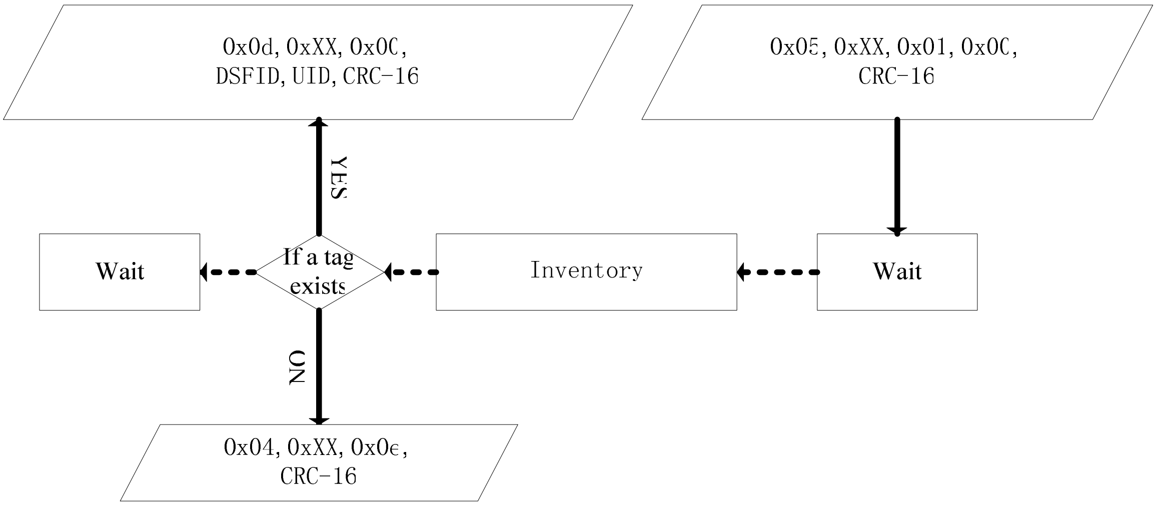
Two operation modes are available for Inventory command:

MODE	STATE	DATA[]	COMMENT
Inventory without AFI	0x00	-	All Ready state tags will respond. Only one tag's UID will be returned and that tag will be turned into Quiet state.
Inventory with AFI	0x01	_AFI	All Ready state tags with the appointed AFI will respond. Only one tag's UID will be returned and that tag will be turned into Quiet state.

7.1.1.1 INVENTORY WITHOUT AFI

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x01	0x00	—	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x0d	0xXX	0x00	DSFID,UID	LSB	MSB



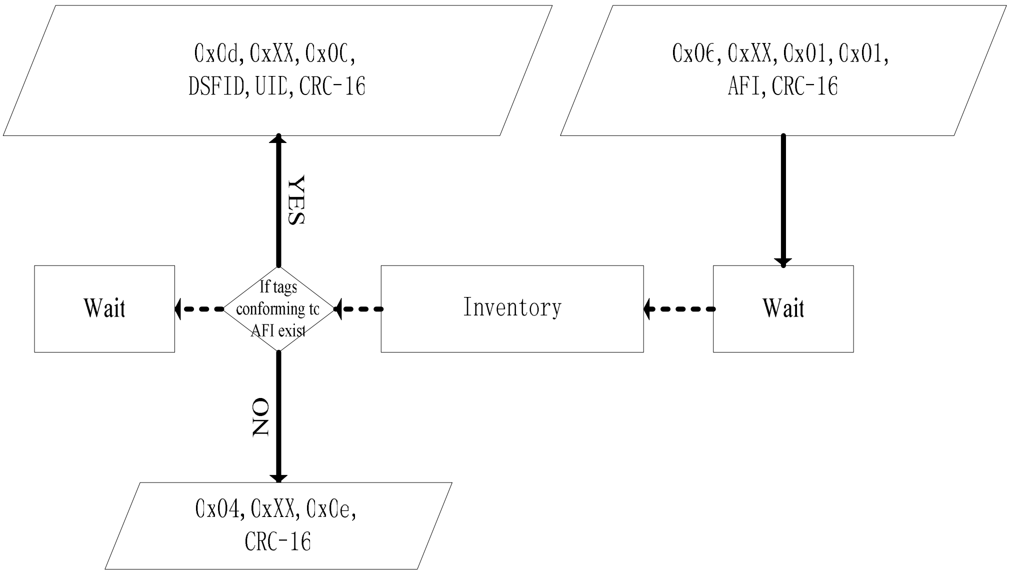
Note: The tag whose UID have been decoded by the readers will be turn into Quiet state.

- Note: If there is at least one Ready state tag in the field and the reader could no decode its UID before InventoryScanTime overflows(for example, the InventoryScanTime has been set to a too small value), the reader will return the response data block: 0x04,0xXX,0x0A,CRC-16.

7.1.1.2 Inventory with AFI

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x01	0x01	AFI	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x0d	0xXX	0x00	DSFID, UID	LSB	MSB



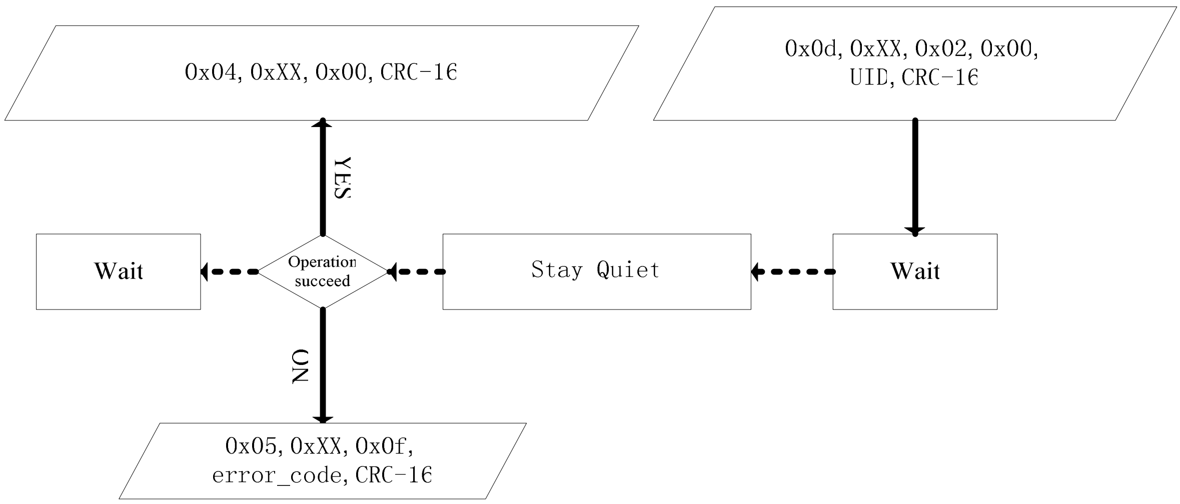
- Note: The tag whose UID have been decoded by the readers will be turn into Quiet state.
- Note: If there is at least one Ready state tag in the field and the reader could no decode its UID before InventoryScanTime overflows(for example, the InventoryScanTime has been set to a too small value), the reader will return the response data block: 0x04,0xXX,0x0A,CRC-16.

7.1.2 STAY QUIET

The host sends this command to let the reader turn the corresponding tag into Quiet state. When a tag in Quiet state, it will not reply any inventory command. But it will still reply any command in addressed mode. There are three ways to make the tag leave Quiet state:

- Tag is taken out of effective field and reentry in it.
- Use Select command to turn the tag into Selected mode.
- Use Reset to ready command to turn the tag into Ready state.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x02	0x00	UID	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



7.1.3 READ SINGLE BLOCK

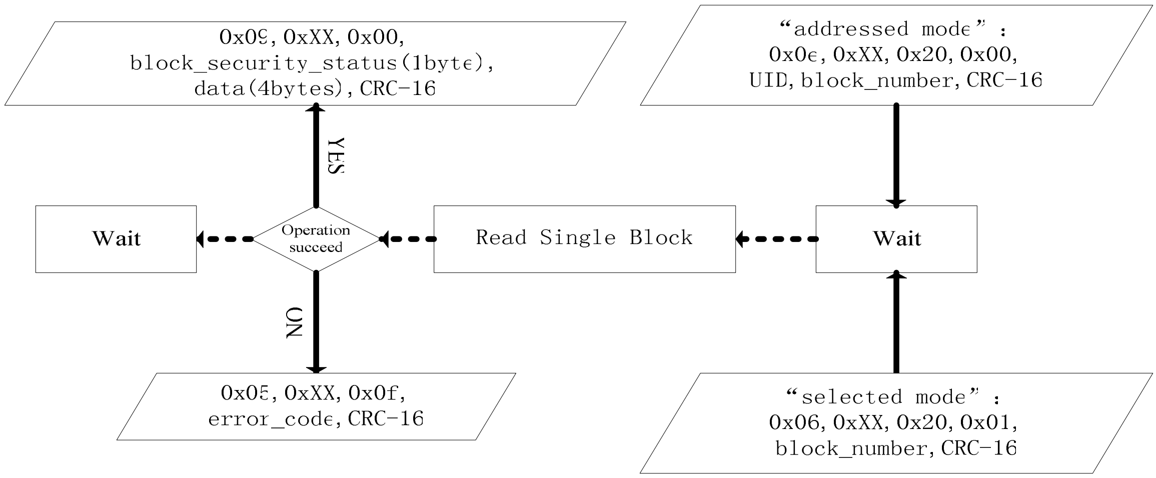
The host sends this command to let the reader read out the corresponding tag's one block content(4 or 8 bytes) and its security status byte.

The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

7.1.3.1 4-BYTE BLOCK

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x20	0x00	UID, block_number	LSB	MSB
0x06	0xXX	0x20	0x01	block_number	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x09	0xXX	0x00	block_security_status, block_data(4bytes)	LSB	MSB

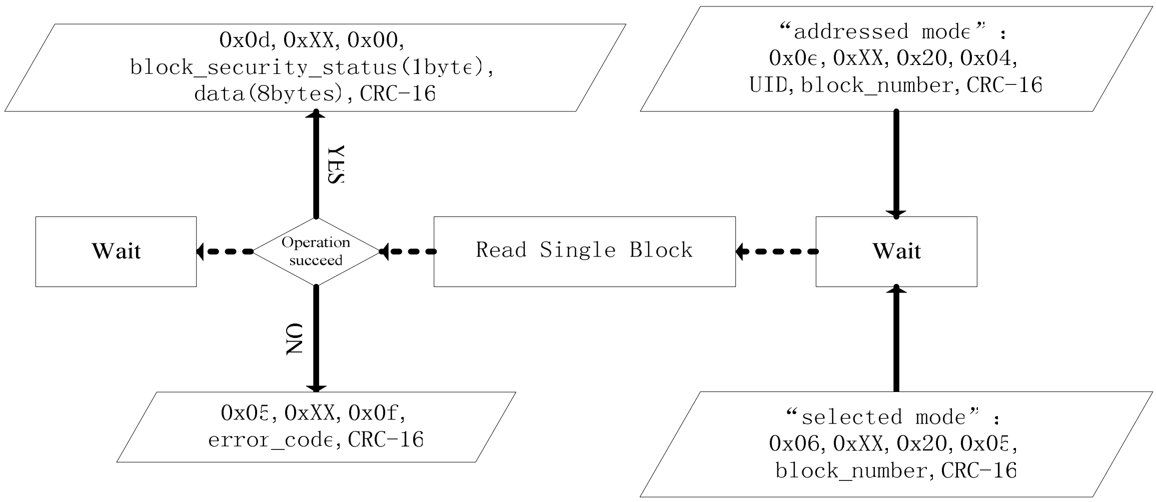


◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.3.2 8-BYTE BLOCK

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x20	0x04	UID, block_number	LSB	MSB
0x06	0xXX	0x20	0x05	block_number	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x0d	0xXX	0x00	block_security_status, block_data(8bytes)	LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.4 WRITE SINGLE BLOCK

The host sends this command to let the reader write corresponding tag's one block content(4 or 8 bytes). The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

If the appointed block has been locked, operation will fail and the reader will return the error_code.

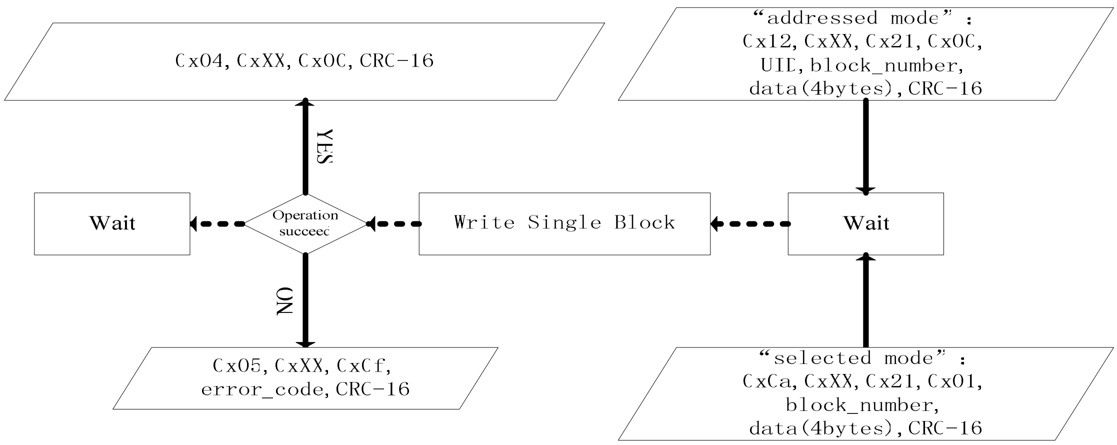
7.1.4.1 4-BYTE BLOCK

There are two types of write operation feedback style corresponding to the Option_flag bit in ISO/IEC defined write command's flag byte. When tag supports write operation with Option_flag=1, it is a type A tag. When tag supports write operation with Option_flag=0, it is a type B tag. Please refer to appendix 1.

Tags of type A：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x12	0xXX	0x21	0x00	UID, block_number, data(4bytes)	LSB	MSB
0x0a	0xXX	0x21	0x01	block_number, data(4bytes)	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB

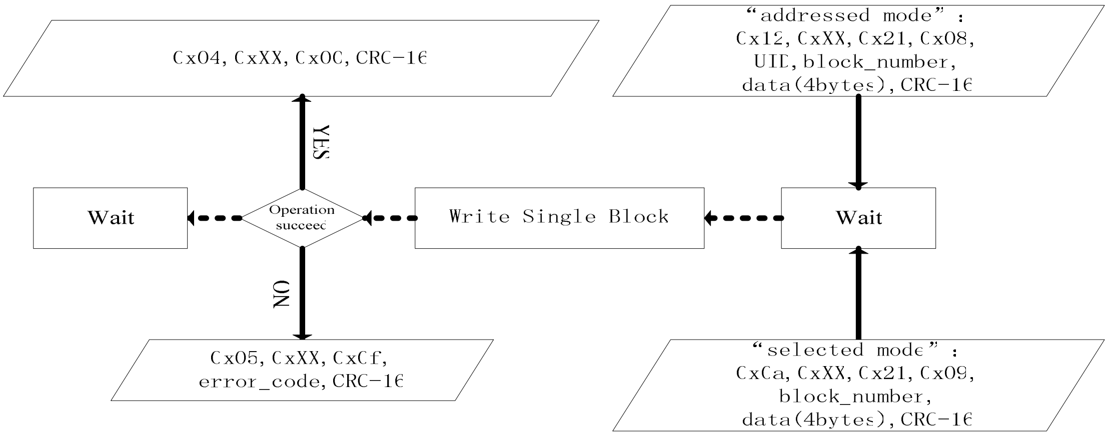


◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B:

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x12	0xXX	0x21	0x08	UID, block_number, data(4bytes)	LSB	MSB
0x0a	0xXX	0x21	0x09	block_number, data(4bytes)	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

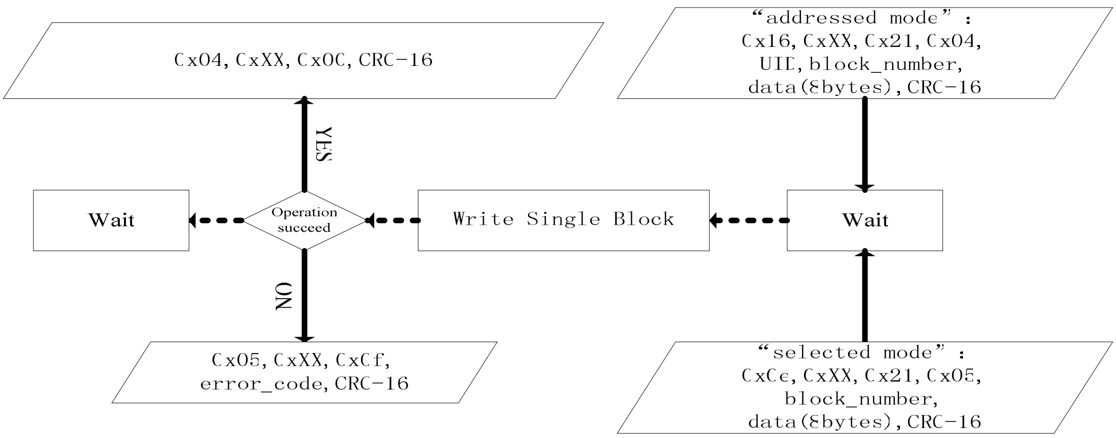
7.1.4.2 8-BYTE BLOCK

There are two types of write operation feedback style corresponding to the Option_flag bit in ISO/IEC defined write command's flag byte. When tag supports write operation with Option_flag=1, it is a type A tag. When tag supports write operation with Option_flag=0, it is a type B tag. Please refer to appendix 1.

Tags of type A：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x16	0xXX	0x21	0x04	UID, block_number, data(8bytes)	LSB	MSB
0x0e	0xXX	0x21	0x05	block_number, data(8bytes)	LSB	MSB

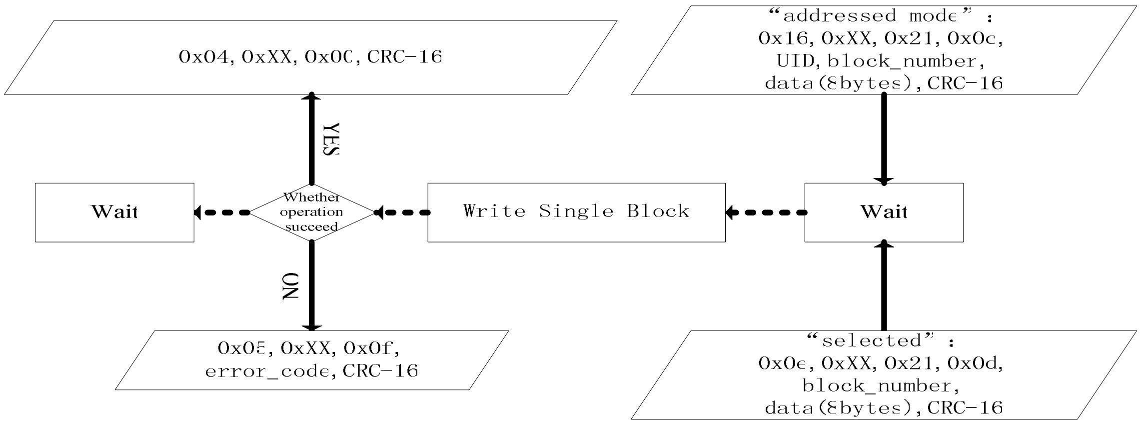
Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x16	0xXX	0x21	0x0C	UID, block_number, data (8bytes)	LSB	MSB
0x0e	0xXX	0x21	0x0D	block_number, data (8bytes)	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

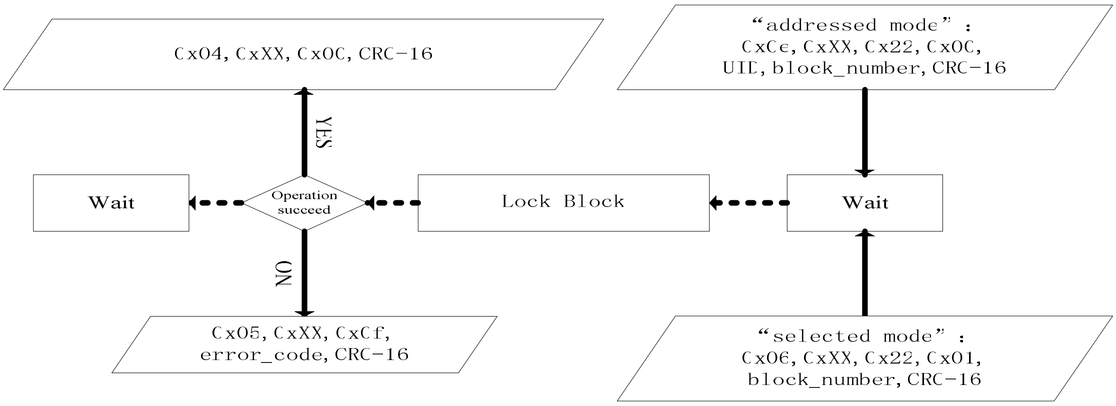
7.1.5 LOCK BLOCK

The host sends this command to let the reader lock the appointed block. When a block has been locked, its content should not be able to change any more.

Lock block is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A：

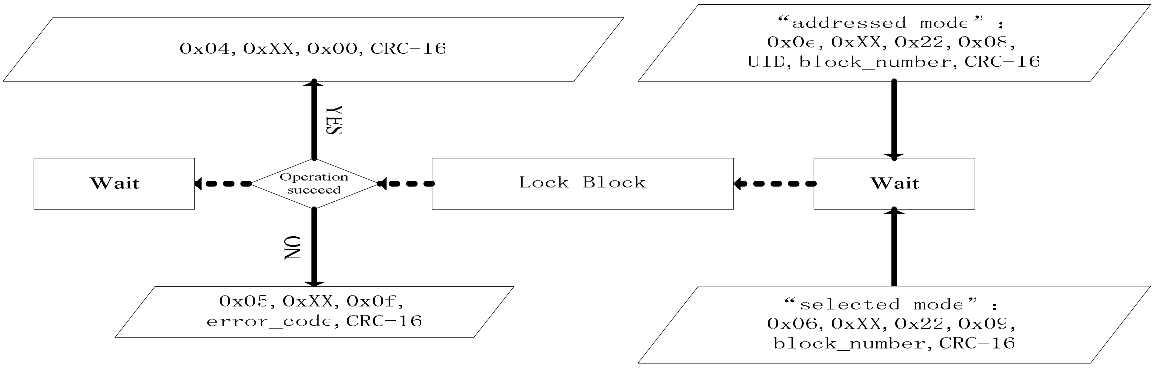
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x22	0x00	UID, block_number	LSB	MSB
0x06	0xXX	0x22	0x01	block_number	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x22	0x08	UID, block_number	LSB	MSB
0x06	0xXX	0x22	0x09	block_number	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.6 Read Multiple Block

The host sends this command to let the reader read out the corresponding tag's several blocks' content(4 or 8 bytes per block) and their security status bytes.

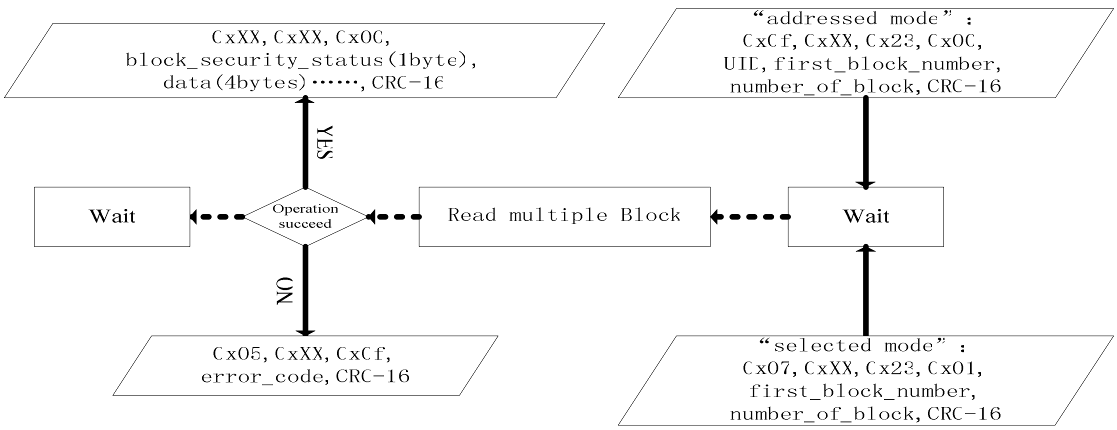
The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

The reader can read out as many as 28 blocks one time with block size is 4 bytes and as many as 15 blocks with block size is 8 bytes.

7.1.6.1 4-BYTE OF BLOCK

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0f	0xXX	0x23	0x00	_UID, _first block number, _number of blocks	LSB	MSB
0x07	0xXX	0x23	0x01	_first block number, _number of blocks	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0xXX	0xXX	0x00	block_security_status, block_data(4bytes) (Repeated times equals _number of blocks)	LSB	MSB

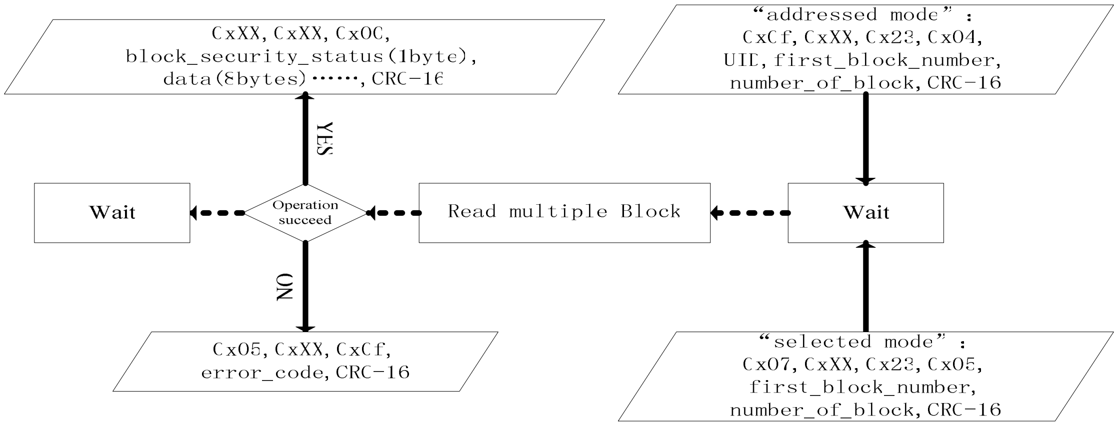


◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.6.2 8-BYTE OF BLOCK

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0f	0xXX	0x23	0x04	_UID, _first block number, _number of blocks	LSB	MSB
0x07	0xXX	0x23	0x05	_first block number, _number of blocks	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0xXX	0xXX	0x00	block_security_status, block_data(8bytes) (Repeated times equals _number of blocks)	LSB	MSB

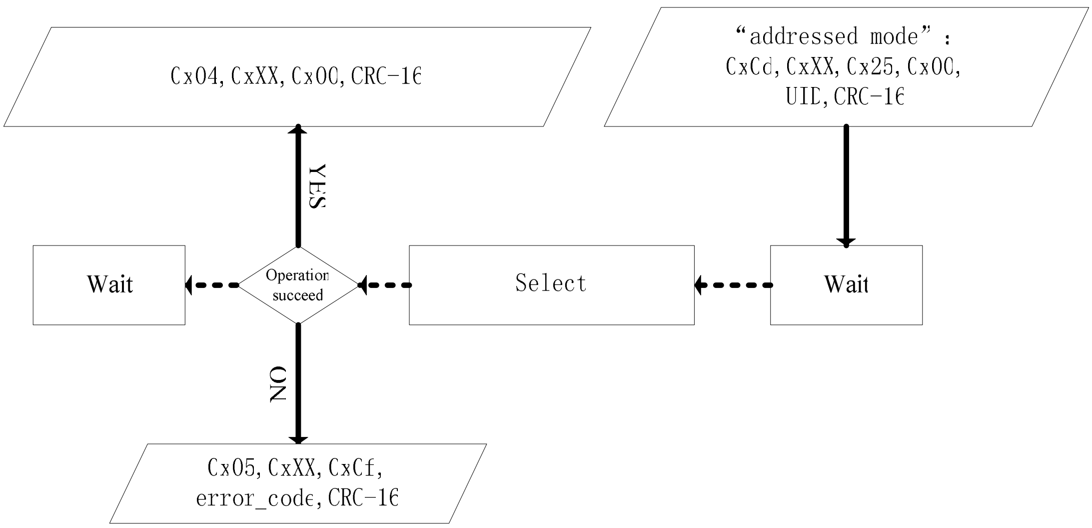


◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.7 SELECT

The host sends this command to let the reader turn the appointed tag into Selected state. All selected mode commands are aiming to the tag in Selected state. There is only one tag in Selected state at a time in the effective field. When turning a new tag into Selected state, the former Selected state tag will turn into Ready state. User can also use this command to turn a tag from Quiet state into Selected state. This command can only run in Addressed mode and the command data block must contain UID of the appointed tag.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x25	0x00	UID	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

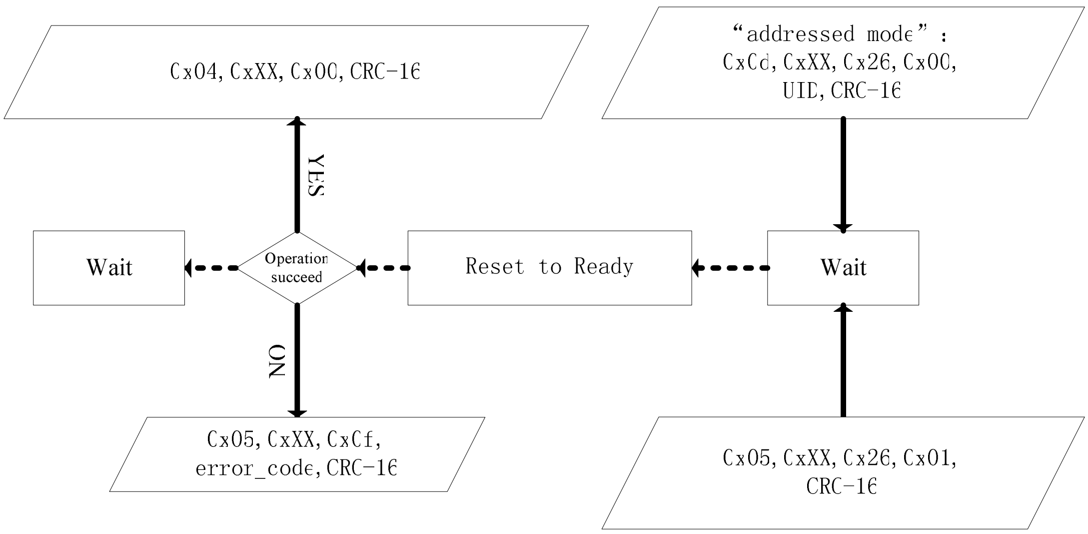
7.1.8 RESET TO READY

The host sends this command to let the reader turn the appointed tag from Quiet state into Ready state.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x26	0x00	UID	LSB	MSB
0x05	0xXX	0x26	0x01	—	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB

This command with state=0x01 will turn all the tags in field from Quiet state into Ready state.



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.9 WRITE AFI

The host sends this command to let the reader write a new AFI value to the appointed tag.

MSB of AFI	LSB of AFI	SIGNIFICATION
0	0	Entire types and subtypes
X	0	Entire subtypes of X type
X	Y	Y subtype of X type
0	Y	Entire Y subtypes
1	0,Y	Transportation
2	0,Y	Finance
3	0,Y	Identity authentication
4	0,Y	Communication
5	0,Y	Medicine

6	0,Y	Multimedia
7	0,Y	Gambling
8	0,Y	Data storage
9	0,Y	Item management
A	0,Y	Express package
B	0,Y	Post office
C	0,Y	Airmail package
D	0,Y	
E	0,Y	
F	0,Y	

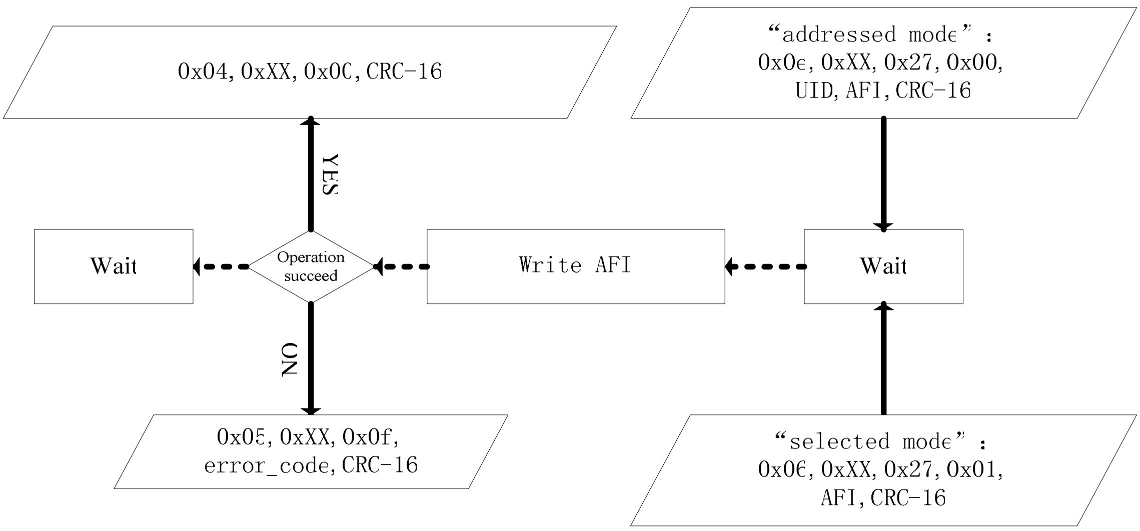
◆ Both "X" and "Y" represents 1～F

Write AFI is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A：

Len	**Com_adr**	**Cmd**	**State**	**Data[]**	**CRC-16**	
0x0e	0xXX	0x27	0x00	UID, AFI	LSB	MSB
0x06	0xXX	0x27	0x01	AFI	LSB	MSB

Len	**Com_adr**	**Status**	**Data[]**	**CRC-16**	
0x04	0xXX	0x00	—	LSB	MSB

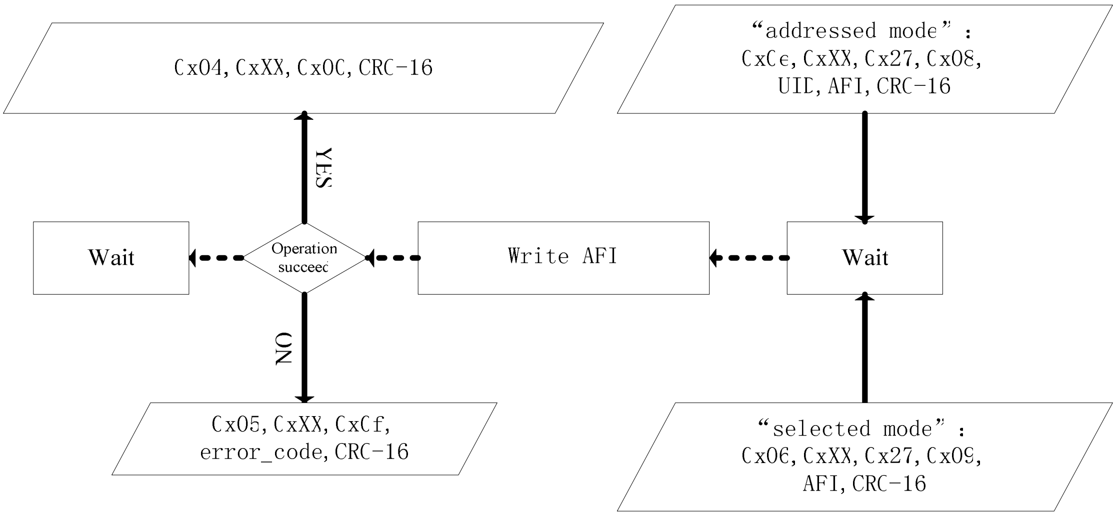


◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B：

Len	**Com_adr**	**Cmd**	**State**	**Data[]**	**CRC-16**	
0x0e	0xXX	0x27	0x08	UID, AFI	LSB	MSB
0x06	0xXX	0x27	0x09	AFI	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.10 LOCK AFI

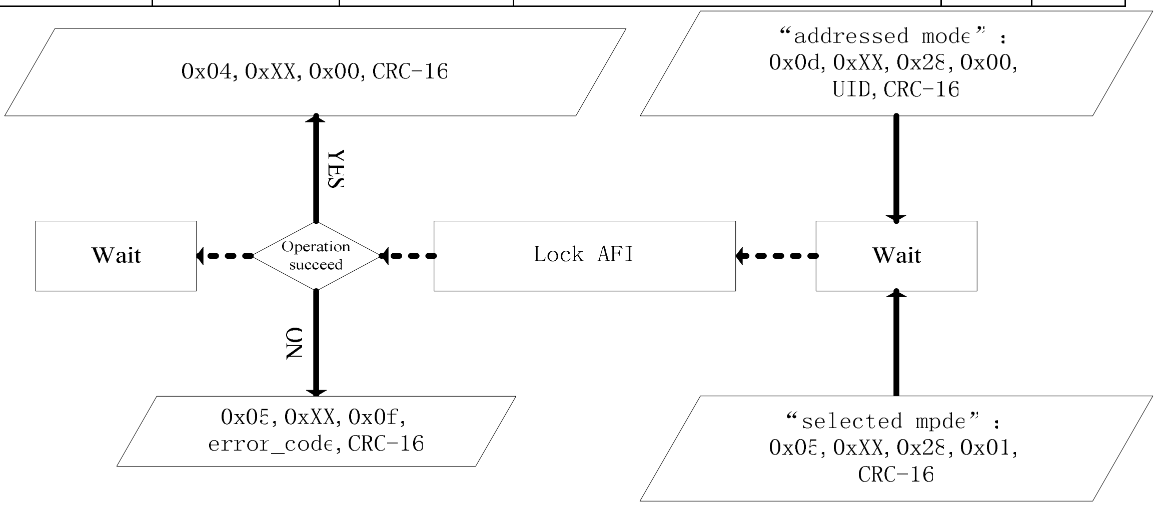
The host sends this command to let the reader lock the tag's AFI value. When a tag's AFI has been locked, its value should not be able to change any more.

Lock AFI is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x28	0x00	UID	LSB	MSB
0x05	0xXX	0x28	0x01	—	LSB	MSB

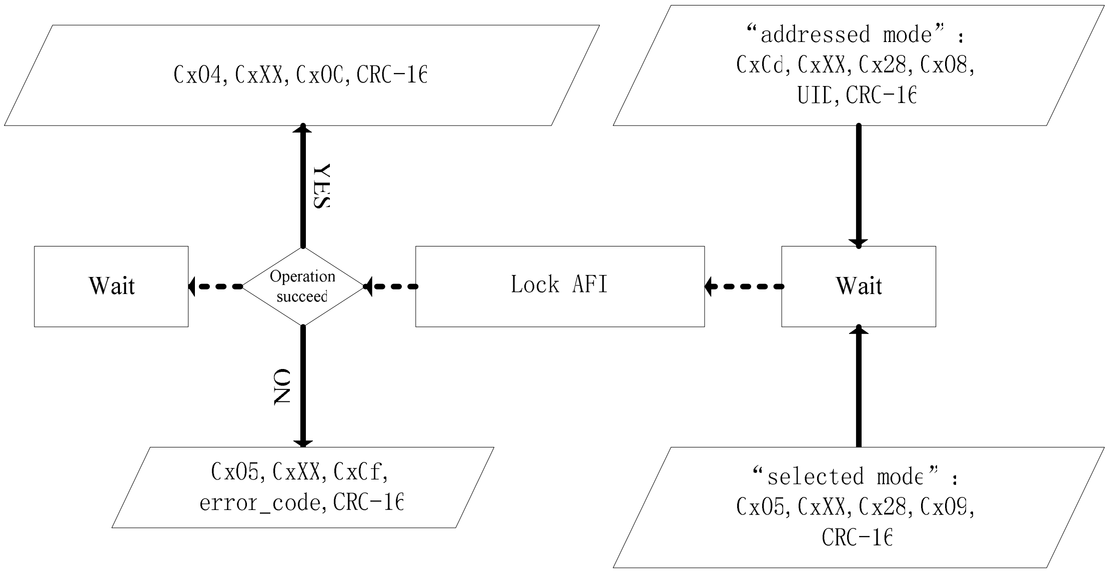
Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B：

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x28	0x08	UID	LSB	MSB
0x05	0xXX	0x28	0x09	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

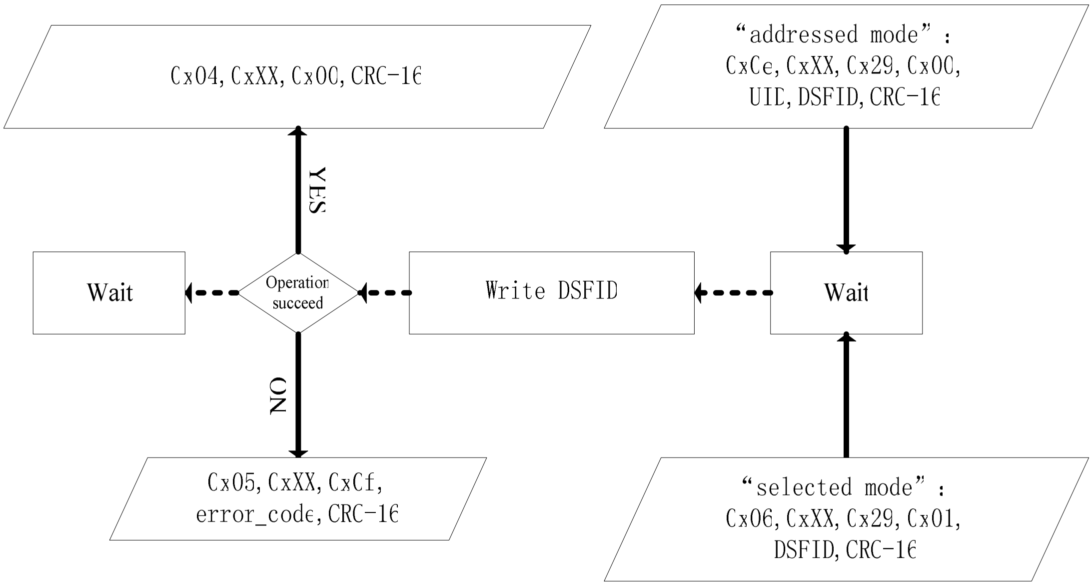
7.1.11 WRITE DSFID

The host sends this command to let the reader write a new DSFID value to the appointed tag.

Write DSFID is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A：

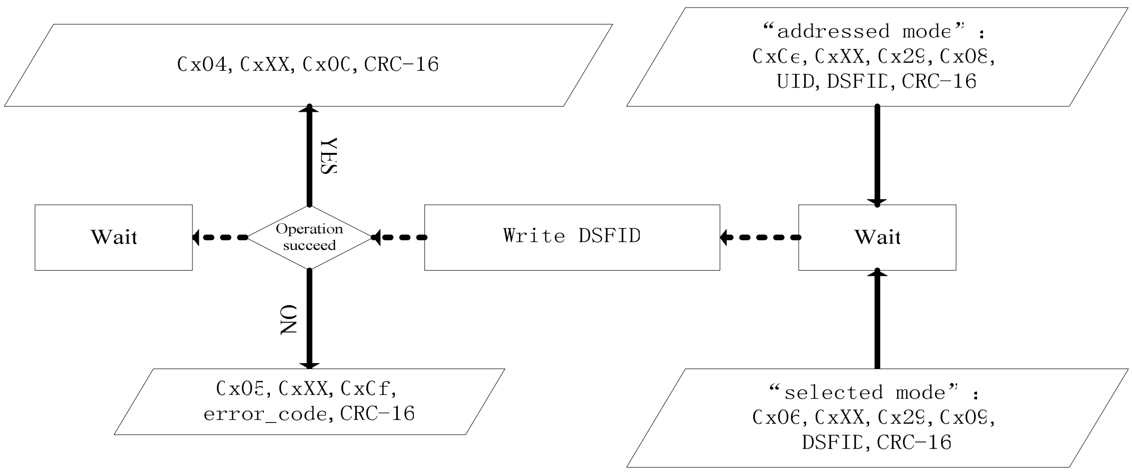
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x29	0x00	UID, DSFID	LSB	MSB
0x06	0xXX	0x29	0x01	DSFID	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B:

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x29	0x08	UID, DSFID	LSB	MSB
0x06	0xXX	0x29	0x09	DSFID	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

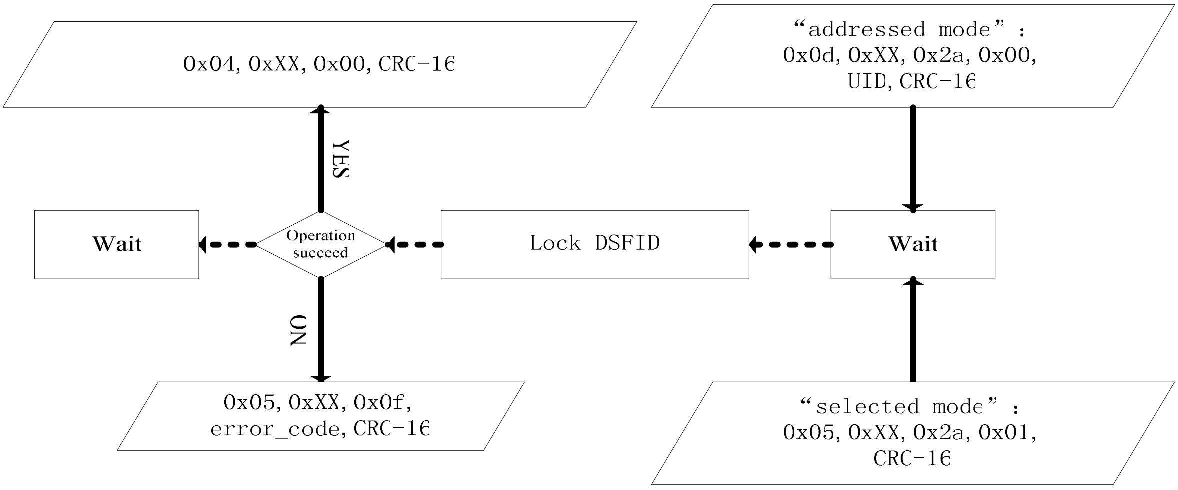
7.1.12 LOCK DSFID

The host sends this command to let the reader lock the tag's DSFID value. When a tag's DSFID has been locked, its value should not be able to change any more.

Lock DSFID is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A：

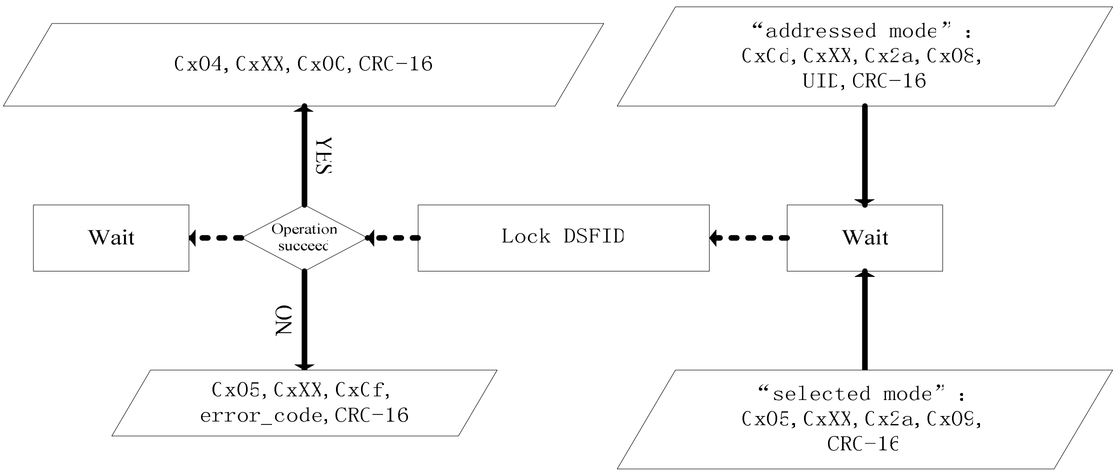
Len	**Com_adr**	**Cmd**	**State**	**Data[]**	**CRC-16**	
0x0d	0xXX	0x2A	0x00	UID	LSB	MSB
0x05	0xXX	0x2A	0x01	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B：

Len	**Com_adr**	**Cmd**	**State**	**Data[]**	**CRC-16**	
0x0d	0xXX	0x2A	0x08	UID	LSB	MSB
0x05	0xXX	0x2A	0x09	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



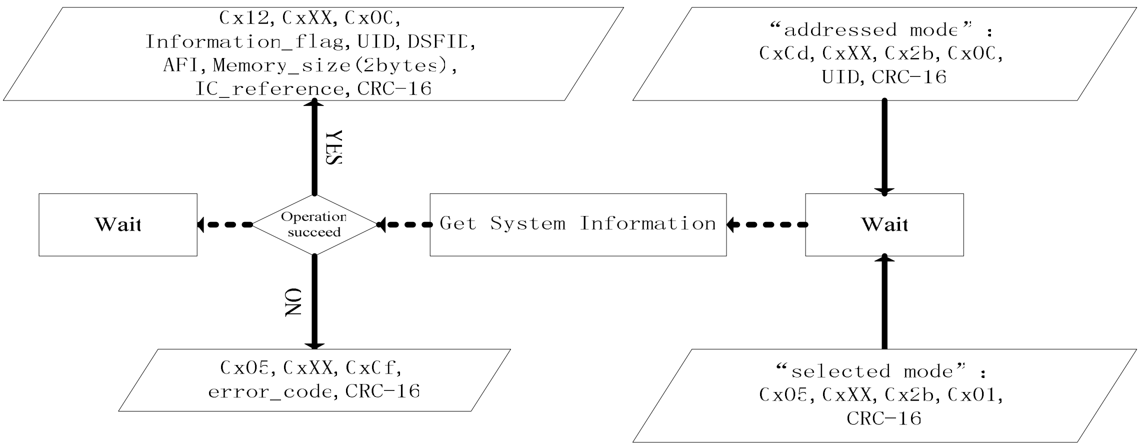
◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.13 GET SYSTEM INFORMATION

The host sends this command to let the reader get the detailed information of the appointed tag's. The information include 1 byte information_flag, 8 byte UID, 1 byte DSFID, 1 byte AFI, 2 bytes Memorey_size and 1 byte IC_reference. The every bit meaning of the information_flag is as follows:

BIT	NAME	STATUS	COMMENT
Bit1	DSFID	0	DSFID nonexistence or nonsupport
		1	DSFID existence or support
Bit2	AFI	0	AFI nonexistence or nonsupport
		1	AFI existence or support
Bit3	Memory_size	0	Memory_size nonexistence or nonsupport
		1	Memory_size existence or support
Bit4	IC_Reference	0	IC_Reference nonexistence or nonsupport
		1	IC_Reference existence or support
Bit5	RFU	—	Set to 0
Bit6	RFU	—	Set to 0
Bit7	RFU	—	Set to 0
Bit8	RFU	—	Set to 0

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x2B	0x00	UID	LSB	MSB
0x05	0xXX	0x2B	0x01	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x12	0xXX	0x00	Information_flag, UID, DSFID, AFI, Memory_size(2bytes), IC_reference		LSB	MSB



- ◆ Note: When no tag in the effective field, please refer to former chapter for the content of the response data block.
- ◆ Note: The above chart only describe the situation when "Information flag" =0x0f. If Information_flag is other value, the length and contents of the response data block will alter according to Information_flag's definition.

7.2 READER-DEFINED COMMANDS

5 reader-defined commands are supported to facilitate the using of the RR9036 reader. When the host sends these commands, the high 4 bits of the operation control(state) byte in command data block should be "F".

7.2.1 GET READER INFORMATION

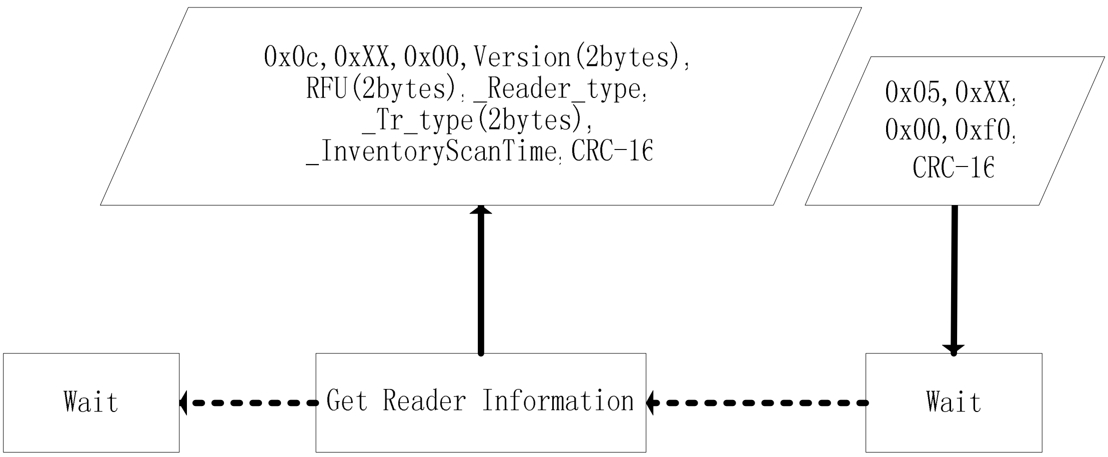
The host sends this command to get the reader's information including reader's address(Com_adr), firmware version, reader type(_reader_type, 0x45 for RR9036), supported protocol(_tr_type) and InventoryScanTime value(default value is 0x1e for 3s).

The supported protocol byte is reserved to 0x00 and 0x08 as follows:

bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Function	—	—	—	—	—	—	—	—
bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Function	—	—	—	—	ISO/IEC 15693	—	—	—

Len	**Com_adr**	**Cmd**	**State**	**Data[]**	**CRC-16**	
0x05	0xXX	0x00	0xf0	—	LSB	MSB

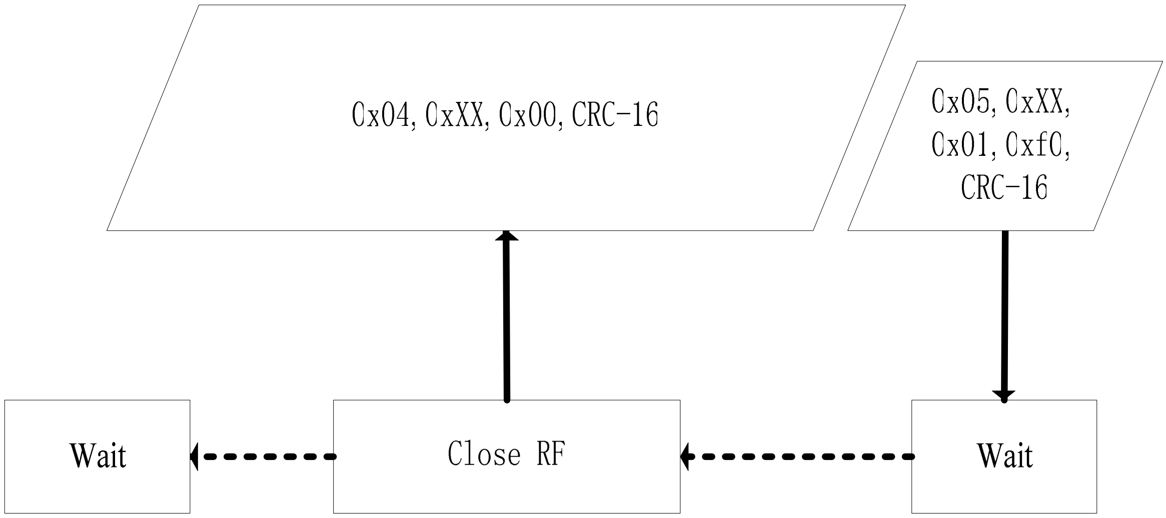
Len	**Com_adr**	**Status**	**Data[]**	**CRC-16**	
0x0c	0xXX	0x00	Version(2bytes), RFU(2bytes) _Reader_type, _Tr_type(2bytes), _InventoryScanTime	LSB	MSB



7.2.2 CLOSE RF

The host sends this command to turn off the RF output of the reader and close the inductive field. When the field is closed, the reader would not run the ISO/IEC 15693 commands and return a response data block indicating the field closed.

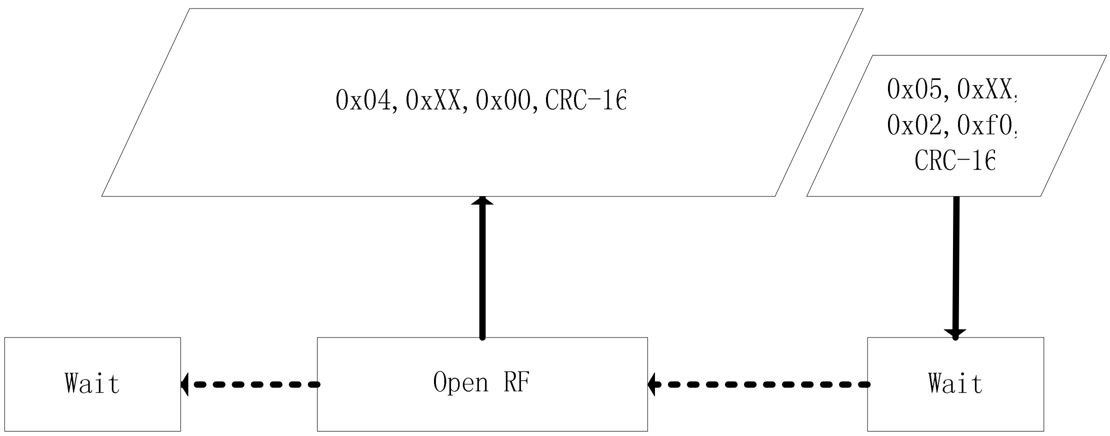
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x01	0xf0	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



7.2.3 OPEN RF

The host sends this command to turn on the RF output of the reader and establish the inductive field. The RF is open when the reader is powered on.

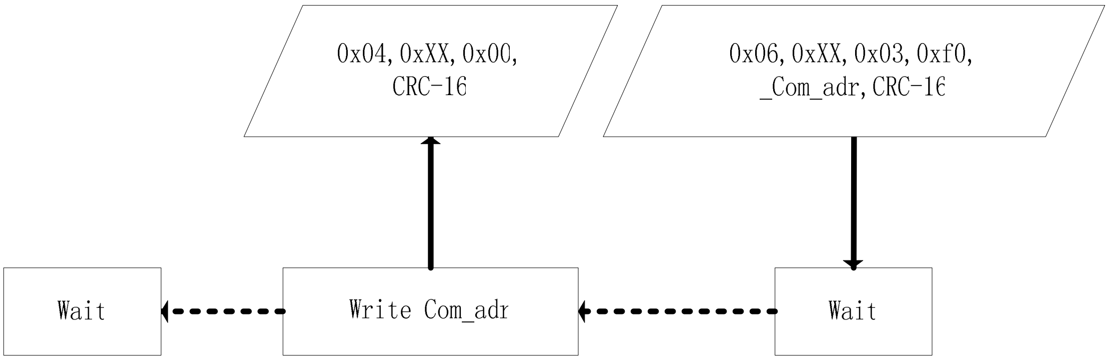
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x02	0xf0	—	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



7.2.4 WRITE Com_adr

The host sends this command to change the address(Com_adr) of the reader. The address data is stored in the reader's inner EEPROM and is nonvolatile after reader powered off.. The default value of Com_adr is 0x00. The range of Com_adr is 0x00~0xFE. When the host tries to write 0xFF to Com_adr, the reader will set the value to 0x00 automatically.

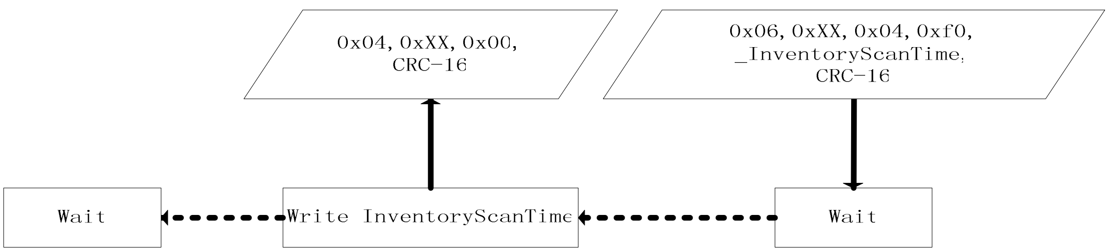
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x03	0xf0	_Com_adr	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



7.2.5 WRITE InventoryScanTime

The host sends this command to change the value of InventoryScanTime of the reader. The value is stored in the reader's inner EEPROM and is nonvolatile after reader powered off.. The default value is 0x1E (corresponding to 30*100ms=3s). The value range is 0x03~0xFF(corresponding to 3*100ms~255*100ms). When the host tries to set value 0x00~0x02 to InventoryScanTime, the reader will set it to 0x03 automatically. In various environments, the actual inventory scan time may be 0~75ms longer than the InventoryScanTime defined.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x04	0xf0	_InventoryScanTime	LSB	MSB
Len	**Com_adr**	**Status**	**Data[]**		**CRC-16**	
0x04	0xXX	0x00	—		LSB	MSB



Appendix 1

MANUFACTURER	Manu. CODE	BLOCK INFORMATION		TYPE	
		BLOCK NUMBER	BLOCK SIZE	TYPE A	TYPE B
Infineon (ISO Address mode)	0x05	256 (user available range:0~249)	4 bytes		√
		64 (user available range:0~57)	4 bytes		√
STMicroelectronics (LRI512)	0x02	16 (user available range:0~15)	4 bytes		√
Fujitsu (MB89R116)	0x08	256 (user available range:0~249)	8 bytes	√	√
Philips (I-Code SLI)	0x04	32 (user available range:0~27)	4 bytes		√
Texas Instruments (Tag-it HF-I)	0x07	64 (user available range:0～63)	4 bytes	√	

- Tags of type A corresponds to Option_flag=1 in ISO/IEC 15693 protocol. Tags of type B corresponds Option_flag=0 in ISO/IEC 15693 protocol.
- As to tags not included in the appendix, please refer to their datasheets.